



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

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Project Title Cyanobacteria: A Renewable Energy Source	
Objectives/Goals Sustainable energy never seemed so green. The use of cyanobacteria as a renewable energy source is highly innovative and current because the world has to look into new alternative ways to create energy that does not burn fossil fuels. The purpose of this project is to identify the most efficient way to create an electrical current generated by a redox reaction from cyanobacteria. Abstract Methods/Materials Two strains of cyanobacteria, <i>Anabaena inaequalis</i> (freshwater) and <i>Synechococcus</i> sp. (marine) were cultured in fresh water Alga-Gro media and sea water supplemented with F2/Si respectively, at 22oC and a 13/11 light dark cycle. Each strain was placed in a voltaic bioreactor and the voltage and current were evaluated over time. Media controls were also run for each cyanobacteria. Results The results with <i>Anabaena</i> data show that an increase in cell density could be generally correlated with an increase in voltage. The results demonstrated the voltage output from both <i>Anabaena inaequalis</i> and <i>Synechococcus</i> sp. had a cyclical nature that correlated to the 13/11 light dark cycle, with a higher voltage recorded during the light cycle. In this experiment, the freshwater cyanobacteria, <i>Anabaena</i> , produced an initially greater voltage than the marine cyanobacteria, <i>Synechococcus</i> sp., at 24 hours, although this was not the case after 48 hours (cell density 0.70 absorbance). Conclusions/Discussion The results show that it could be possible to generate an even greater voltage with a greater cyanobacteria density. This shows the potential to scale up the voltaic bioreactor and generate a greater voltage. The light dark cycle demonstrated a greater voltage output during the light cycle coinciding with photosynthesis. It was not possible to conclude as to which strain of cyanobacteria had the greater potential from these experiments. However the voltage gradually declined over 3 days with both strains indicating that with the experimental set-up they were not self-sustaining in the long term. Future experiments are planned to explore further optimizations and test other strains.	
Summary Statement The purpose of this project is to identify the most efficient way to create an electrical current generated by a redox reaction from cyanobacteria.	
Help Received Dr. Willoughby as teacher and mentor.	